

Unit 15

Day 1

Synthetic Division

NOTE: Synthetic division may only be used when dividing by a linear binomial in the form $x-k$.

Use synthetic division to perform the division.

$$1) \quad (x^3 + 4x^2 - 2x - 12) \div (x+3)$$

$$\begin{array}{r|rrrr} -3 & 1 & 4 & -2 & -12 \\ & & -3 & -3 & 15 \\ \hline & 1 & 1 & -5 & 3 \end{array}$$

$$x^2 + x - 5 + \frac{3}{x+3}$$

Write answer in form $\text{quotient} + \frac{\text{remainder}}{\text{divisor}}$ (unless otherwise noted).

$$2) \frac{x^4 - 2x^2 - 4x}{x - 3}$$

$$\begin{array}{r|rrrrr}
 3 & 1 & 0 & -2 & -4 & 0 \\
 & & 3 & 9 & 21 & 51 \\
 \hline
 & 1 & 3 & 7 & 17 & 51 \\
 & x^3 + 3x^2 + 7x + 17 + \frac{51}{x-3}
 \end{array}$$

NOTE the skipped terms (especially the constant).

$$3) \quad (x^2 + 2x + 1) \div \left(x + \frac{1}{2}\right)$$

$$\begin{array}{r} -\frac{1}{2} \overline{) \begin{array}{r} 1 2 1 \\ - \frac{1}{2} \frac{3}{4} \\ \hline 1 \frac{3}{2} \frac{1}{4} \end{array}} \\ 1 \frac{3}{2} \frac{1}{4} \end{array}$$

$$x + \frac{3}{2} + \left(\frac{-\frac{1}{4}}{x + \frac{1}{2}}\right) \frac{4}{4} = x + \frac{3}{2} + \frac{1}{4x+2}$$

NOTE: No complex fractions in your final answer.

Express each polynomial in the form $f(x) = (x - k)q(x) + r$ for the given value of k .

↑
called the division algorithm

4) $f(x) = x^4 - 5x^2 - 10x + 12; \quad k = 2$

$$\begin{array}{r|rrrrr} 2 & 1 & 0 & -5 & -10 & 12 \\ & & 2 & 4 & -2 & -24 \\ \hline & 1 & 2 & -1 & -12 & -12 \end{array}$$

$$f(x) = (x^3 + 2x^2 - x - 12)(x - 2) - 12$$

5) $g(x) = 5x^3 - 6x^2 - 28x - 2; \quad k = -2$

$$\begin{array}{r}
 -2 \overline{) 5 \quad -6 \quad -28 \quad -2} \\
 \underline{ } -10 \quad 32 \quad -8} \\
 5 \quad -16 \quad 4 \quad -10
 \end{array}$$

$$g(x) = (5x^2 - 16x + 4)(x + 2) - 10$$

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